EMGT 835 FIELD PROJECT:
Market Technical Analysis for the iMarket Meter Data Management System

By

Patrick Lowe

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Name Date
Committee Chair

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Name Date
Committee Member

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Name Date
Committee Member

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1 Acknowledgements

I would like to thank my committee members who have contributed to this field project. Their input has made this field project more complete and concise and ultimately a better guide for developing the MDMS customer base.

I'd also like to thank everyone at Swift Technologies who served as editors and provided input for this project. I would also like to thank Swift Technologies for the opportunity to initially get involved in, and learn about, wholesale electric markets. The experience has been challenging and rewarding.

And last, but not least, I'd like to thank my family, especially my wife who played the role of a single parent more often than not while I've worked on my EMGT degree.

2 Executive Summary

Based on recent success with Swift's iMarket Meter Data Management System (MDMS) product in the Southwest Power Pool (SPP), additional wholesale energy markets need to be analyzed to determine the feasibility of marketing and selling the MDMS product in those markets.

The Federal Energy Regulatory Commission (FERC) is promoting the voluntary formation of Regional Transmission Organizations (RTO). One goal of a RTO is to promote efficiency in wholesale electric markets to provide the lowest price possible for reliable electric service[1]. The Commission's policy with regard to RTOs is contained in Order 2000. Throughout the United States, RTOs have been formed or are being formed to comply with FERC's RTO requirements.

The SPP has recently been granted RTO status by FERC. SPP is currently implementing a wholesale electric market for its member utilities and other non-member utilities that plan to sell energy into the SPP market. There are currently ten other established and proposed RTOs in North America that are comprised of member utilities that are required to submit meter data to support the market's settlement processes. Every utility that is participating in a wholesale electric market is a potential customer for the MDMS product. The number of member utilities for each RTO varies from eight to over 300.

The MDMS product's core functionality is to format meter data to an RTO specific format and submit it programmatically to the RTO for the RTO's settlement processes.

Each of these RTO markets has been analyzed for the future expansion of marketing and sales of the MDMS product to members of each RTO. Key criteria in the analysis are the age of the market and the technical requirements for formatting meter data and submitting it programmatically.

For reference, the RTO and proposed RTO regions are displayed on the following FERC map. Note that time constraints prevented any in depth analysis of the Independent Electricity System Operator (IESO) and the New York Independent System Operator (NYISO).

[1] Federal Energy Regulatory Committee. "Order 2000 – Docket No. RM99-2-000".

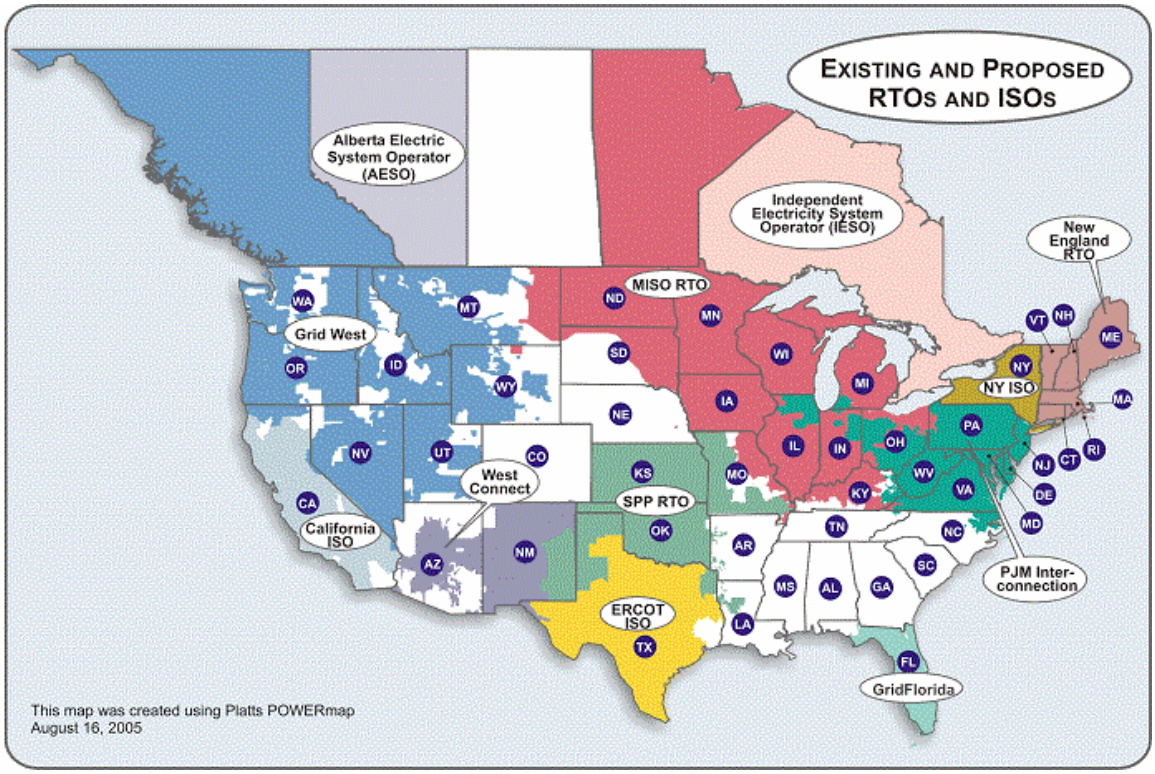

Figure 1 - FERC Map of Regional Transmission Organizations

3 Introduction

The intent of this research is to identify the feasibility of other wholesale electric markets with the current feature set of the iMarket Meter Data Management System (MDMS) product.

The MDMS product was designed and constructed specifically for the wholesale electric market being implemented by the Southwest Power Pool (SPP). Due to the different implementations of each wholesale electric market, MDMS will not be a viable solution in some of the Regional Transmission Organizations (RTO) markets. In some cases, the market design will be so different, it is expected that MDMS will not even be a potential solution. In other cases, the market design will be similar enough that MDMS will be a suitable solution.

3.1 What Is A Wholesale Electric Market?

A wholesale electric market is typically comprised of three other markets; a day-ahead energy market, a real-time energy market and a financial transmission rights (FTR) market.

The day-ahead energy market is a forward market in which hourly clearing prices are calculated for each hour of the next operating day based on the locational marginal pricing (LMP) concept. The result of this market clearing include hourly LMP values, hourly demand and supply quantities, and hourly balancing authority (BA) net scheduled interchange (NSI)[2].

The real-time energy market is a "balancing" market in which the LMPs are calculated periodically (period depends on market implementation but is typically every 5-15 minutes), based on the RTO dispatch instructions and actual system operations.

The FTR market provides an opportunity for market participants to acquire financial transmission rights to manage the risk of congestion costs in the day-ahead energy market. FTRs are financial instruments and do not represent a physical right for delivery of energy. FTRs provide a mechanism to hedge the congestion costs between the point of receipt and point of delivery of the FTR in the day-ahead market. Only market participants can hold FTRs.

The overall purpose of a wholesale electric market is to increase the efficiency and reliability of electric service throughout the region served by the market. Market rules will dictate the price of each megawatt sold through the market using the concept of the LMP. The LMP is the price at which supply equals demand at a specified location[3].

[2] Midwest Independent System Operator. "Market Concepts Study Guide.

[3] California Independent System Operator. "Glossary and Terms"

3.2 Meter Data

Each wholesale energy market has a financial settlement process in which the RTO will calculate what a market participant is owed, or owes. One component of that settlement process is the meter data. Each market participant needs to submit actual meter data to the RTO. This meter data is used to determine the actual flow of electricity in the regional transmission system.

The meter data that is submitted must adhere to the requirements of the RTO. Raw meter data is not submitted to the RTO. Rather, meter data is organized into settlement locations. Each settlement location contains one or more meters and the data for those meters is net'ed (or aggregated). The net data for the settlement location is then submitted to the RTO in an RTO specified format.

4 Detail

4.1 MDMS Overview

MDMS is a web-enabled application that provides a Utility the facility needed to net meter data points to a settlement location, convert it to RTO compatible file format and programmatically upload that file.

The basic function of the application is to allow for Utility personnel to analyze meter data from their proprietary system(s) (SCADA and/or billing) that is to be uploaded, as XML, to a RTO's interface. The process includes four steps.

1. An interface table is populated by meter data loaded from an external Utility specific system. This interface table can be loaded directly via a database link or via a flat file process. The interface table can accept individual meter point data or the net, or aggregated (settlement location) meter data.

2. Data from the interface table is loaded via the application populating the application's normalized table structure.

3. The MDMS web based user interface is used to review the net and actual meter data. "Net meter data" refers to individual meter point data that is rolled up to the settlement location. "Actual meter data" refers to the individual meter point data. The user can then approve or reject the net meter data.

4. Data that is approved is submitted to the RTO. The application generates XML files specific to the LodeStar Interval Data XML Format. The application creates the XML files, archives them, and programmatically uploads them to the RTO. The application can also produce a ZIP file containing the XML files in the event a manual upload process to the RTO's market participant portal is required.

4.2 SWOT Analysis

The following are MDMS' strengths, weaknesses, opportunities and threats.

4.2.1 Strengths

MDMS is a web based application built on reliable, mainstream technologies. These technologies will remain viable as they are constantly being updated and refined by large vendors in the Information Technology space (ex. Oracle, IBM, BEA and Sun).

The database design for MDMS allows for the historical retention of meter data. Due to the financial aspect of the settlement process, the market participant will need the ability to view their historical data that was submitted to the RTO.

The application contains an audit trail for the key data in the system. The audit trail contains the prior state of the data, the new state of the data, the user who modified the data and the date it was modified.

The application implements a robust user security model. This security can be configured to provide all or only a partial level of access to the features and screens in the application.

The user interface is intuitive and provides flexible search criteria that allow the user to drill down on specific data and produce some ad hoc reporting through the search screens.

In addition to the data that is retained in the database, the XML files created by the application are archived for later review or retrieval.

The database design accounts for changes in the assets (meters) and the organization of a utility's settlement locations. The meter points are associated with a settlement location for an effective date. This effective date allows the system to accurately regenerate XML files after a settlement location has changed (i.e. meter points have moved into or out of the settlement location).

The application allows the utility to configure a primary and a backup meter point. Many utilities have multiple metering systems (SCADA and billing) in the field. These meters can be configured to provide redundancy in the system when aggregating meter data. This primary vs. backup structure will also allow utilities to better analyze their meter data.

The application provides data validation for the incoming individual meter point data. Validation occurs for a value repeating over intervals (interval count), a value that is out of bounds, a rate of change between two intervals and a primary vs. backup difference.

A key criteria for selling services or products to an electric utility is other electric utilities that one has worked for are using a product. Due to the complexity of the industry, most electric utilities prefer a company that has industry experience and does not have to be "trained" in the industry first. MDMS is in use with three electric utilities in the SPP.

Current MDMS customers are pleased with the product and have provided great references with potential customers. Due to the non-competing nature of the industry, a SCADA engineer at one customer is volunteering to demonstrate our product with personnel from other utilities that he works with as he feels our product would benefit those other utilities.

4.2.2 Weaknesses

The aggregation process in MDMS is a simple process that is basically a "summing up" of meter data. This simple aggregation is suitable for some market participants but larger market participants will require a more complex aggregation that incorporates losses and other calculations that will produce more accurate meter data.

MDMS currently has three customers but our small customer base has been viewed as a weakness with some potential customers. A concern that has been expressed is our level of support with a small customer base.

4.2.3 Opportunities

In house solutions may not be as robust or have the extensive features available in MDMS. Once markets are running for a few years, market participants may find a need for a robust, feature rich solution.

A Swift consultant has been on-site with one of the MDMS customers and has developed a custom solution for that customer that has a more complex, robust aggregation process (this custom solution complements the MDMS functionality). The contract this consultant is working under gives Swift the data rights to this process. This process can be incorporated, or emulated, in the MDMS product providing a better aggregation process.

MDMS has only been marketed and sold in one wholesale electric market. Other markets exist in North America and MDMS may be suitable for those markets (the intent of this field project).

Due to cyber security initiatives and additional systems that are needed in a utility to be a part of a wholesale electric market, internal Information Technology departments are typically overwhelmed. They may have the resources to develop a solution but those resources are unavailable and a packaged solution is necessary.

4.2.4 Threats

MDMS is a niche solution for a need that seems to be a low priority for some utilities that have created simple in-house solutions. These solutions are not typically robust or automated but potential customers have solved the problem, no matter how rough the solution may be, and may be willing to live with the rough application due to the amount of money that has been spent joining a market in the first place.

Most of our competition so far has not addressed this need. However, our primary competitors have a larger development staff and if they chose to address the need, could do so quickly.

Other competitors that have developed this type of solution have incorporated this solution with other more advanced features for managing meter data.

Internal Information Technology departments could slow, or completely halt the entry of MDMS with a utility. Internal IT departments have expressed concern about the cost of implementing MDMS due to the need for data feeds from other systems and about the support a smaller company can provide.

4.3 Key Market Criteria

There is no standard design for the wholesale energy markets that exist in North America. Some markets emulate the actions of a control area where they take on some of duties of a local electric utility but do so at a regional level for all of the utilities in their geographic footprint. Other markets are created and maintained by the RTO who facilitates the market transactions for all of the participants in the market. Each type of market has very different technical requirements and a software solution that works in one market does not always work in the other.

Markets that emulate a control area operate in an almost complete real-time capacity. This means that the RTO will “poll”, or read, meters that are maintained by market participants.

Other markets require that the market participants submit actual meter data daily. This meter data is used to determine the flow of energy on the grid and calculate the settlements for each market participant.

The latter market is where MDMS is viable. MDMS provides the user interface for a market participant to review, approve and submit their meter data. MDMS is built around a 24 hour day where meter data is displayed for each hour of the operating day.

The former market is where MDMS is not viable as the RTO will already have the meter data.

4.4 Southwest Power Pool

The Southwest Power Pool (SPP) wholesale electric market is the market that MDMS was created for initially. The SPP is currently undergoing market trials (testing) and market implementation will be May 1, 2006[4].

MDMS is currently in use by three SPP market participants. Each customer is using the same core functionality provided in the MDMS system. One customer is using a subset of the overall functionality of MDMS and the other two will be using a complete version of MDMS.

The remaining market participants have developed in-house solutions. Some feedback received from contacting these market participants has indicated that these in-house solutions have been quickly thrown together and will probably be temporary. This means that once the SPP market is launched and the settlements process is binding, additional customers may be identified when in-house systems may be inadequate.

4.4.1 Technical Summary

The SPP has developed technical specifications for submitting meter data on a daily basis. Meter data being submitted must be in the "LodeStar Interval XML Format" (third party vendor format). This format provides the structure to load 24 hours of meter readings (one per hour, one hour is one interval) and other data for the attributes of the meter data. Examples of attributes are unit of measure, estimated flag, pulse offset, pulse multiplier, etc. SPP market systems require that the XML file only contain one day's data for one settlement location (i.e. interconnect, generator, or load meters).

MDMS utilizes a SPP programmatic interface to submit the meter data. The programmatic interface utilizes the web services technology Simple Object Access Protocol (SOAP). SOAP is essentially an XML "wrapper" around the data that is to be uploaded to the programmatic interface. MDMS connects to the SPP interface via a URL and passes, or uploads, the data to the interface. The interface returns a message indicating a successful upload or will return any errors that were encountered during the submittal.

Refer to the SPP Specifications (Section 10.1) for the file specifications.

4.5 Wholesale Energy Markets

4.5.1 Alberta Electric System Operator

The Alberta Electric System Operator (AESO) wholesale electric market was launched in August, 2005[5].

4.5.1.1 Technical Summary

The AESO specifies Comma Separated Values (CSV) file formats for the meter data. The first is the Daily Interval Meter (DIM) format and the second is Daily Cumulative Meter (DCM) format.

[4] Southwest Power Pool. "Imbalance Market Schedule (PDF)"

[5] Alberta Electric System Operator, "Participant Manual"

The DIM file format submits individual meter data (i.e. has not been "aggregated"). The DCM file format submits cumulative meter data that is meter data that has been aggregated to a settlement location.

In addition to the meter data file formats, the registration information used for the settlements also has a file format. These files are provided to AESO to allow for bulk maintenance of the registration data stored by AESO.

The file transfers are handled by a product called DropChute™ from Hilgraeve (http://www.hilgraeve.com/dropchute). DropChute™ is file delivery software that transfers files over the Internet providing a secure transfer for files of any size. The product allows for submittal between two organizations using the product.

Refer to the AESO Specifications (Section 10.2) for the file specifications.

4.5.1.2 Comparison

AESO has specified multiple, different file formats than the existing single file format supported by MDMS. There are two formats for meter data and additional formats for the supporting data (settlement locations configuration for example).

These file formats contain additional data that is not stored in the MDMS database. The overall configuration of the registration data also appears to need additional data structures not present in MDMS. The MDMS file generation component would need to updated to handle the new formats, or additional components would need to be delivered to handle the new formats.

MDMS' file upload capability is negated due to the use of the DropChute™ product leaving only the file generation and storage capabilities of MDMS as viable features.

4.5.2 California Independent System Operator

The California Independent System Operator (CAISO) recently received approval from the Federal Energy Regulatory Commission for a market redesign[6]. The CAISO market redesign is scheduled to be implemented in February 2007.

Due to the short term nature of the existing market, the technical aspects of the existing CAISO market will not be researched further.

4.5.3 Electric Reliability Council of Texas

The Electric Reliability Council of Texas' (ERCOT) wholesale electric market was launched on January 1, 2002[7].

ERCOT polls market participants' meters for the meter readings that are needed for controlling the flow of electricity in the region and for the data needed for settlements. The means the participants do not need to submit daily meter data to ERCOT. This characteristic practically negates the need for the MDMS product for any market participants.

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[6] Federal Energy Regulatory Commission, "News Release – California Power Market Redesign Receives Commission's Approval"

[7] Electric Reliability Council of Texas, "Settlement Metering Operating Guides"

4.5.4 Grid Florida

Grid Florida received FERC's provisional approval of RTO status on January 10, 2001[8]. As of September 8, 2003, Grid Florida had a filing with the Florida Public Service Commission (FPSC) and was still working on the market design[9].

No other documentation was found pertaining to the status of the Grid Florida wholesale electric market. It is assumed that Grid Florida is still working on a market design that will be approved by FERC, the FPSC and the member utilities.

4.5.5 Grid West

Grid West is not an RTO and has no wholesale energy market. Grid West is currently proposing the formation of an independent system operator (ISO) to facilitate transmission services to potential members in the Grid West region[10]. This proposal is broken up by four decision points. All four decisions must be made before Grid West can begin commercial operations.

The first decision point was on December 9, 2004 when the "Developmental Bylaws" that currently govern Grid West activities were adopted.

The second decision point was on September 29, 2005. This decision was made by the regional parties determining if they support an integrated proposal, prepared by the Grid West Regional Representatives Group. This decision has been postponed until November 1, 2005 by the Interim Board[11]. If the decision is positive, a new Board of Trustees will be elected to manage the Grid West development process though the next two decisions.

The third decision point is the point at which the Developmental Board must offer agreements to the transmission owners for the use of their facilities. The fourth decision point is the final decision by Grid West's members about whether to launch the Grid West operational stage.

Due to the fact that Grid West is in the development stages for operating as an ISO, there is no Grid West wholesale electric market available to be analyzed.

4.5.6 Independent System Operator New England

The Independent System Operator New England's (ISONE) first wholesale electric market was launched in 1997. ISONE's market was recently redesigned and improved in 2003[12].

4.5.6.1 Technical Summary

The ISONE has developed technical specifications for submitting meter data daily. Meter data being submitted is in an ISONE specific format. This format provides the structure to load 24

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[8] Federal Energy Regulatory Commission. "Order RT01-67 – Docket No. RT01-67-000"

[9] Florida Public Service Commission, "Docket No. 020233-EI"

[10] Grid West, "Executive Summary of Grid West Proposal with Links to Additional Information"

[11] Grid West, "Brief Summary of September 29, 2005 RRG Meeting"

[12] Independent System Operator New England. "Corporate Profile and Timeline".

hours of meter readings (one per hour). This format allows for multiple assets (settlement locations) in one file per day.

ISONE's programmatic interface has been designed to emulate a web server in that any connecting process needs to transfer data to the interface using the HTTP protocol. Browsers transfer data to web servers via the HTTP protocol.

ISONE first requires a login, then after verification allows the upload and provides a response to the upload.

Refer to the ISONE Specifications (Section 10.3) for the file format and upload specifications.

4.5.6.2 Comparison

The ISONE upload file format and programmatic upload specification are significantly different than the specification supported by MDMS. The file format is an XML format that could be incorporated into MDMS but the new file format would require some re-architecting of the file creation component in the application.

The new file format also requires some additional database structures and changes to provide the additional information.

The programmatic upload specification is very different from the SPP specification. It uses a different protocol. A completely new upload component would need to be added to the MDMS application.

4.5.7 Midwest Independent System Operator

The Midwest Independent System Operator (MISO) wholesale electric market was launched on April 1st, 2005[13].

4.5.7.1 Technical Summary

The MISO has developed technical specifications for submitting meter data on a daily basis. Meter data being submitted must be in the "LodeStar Interval XML Format" (third party vendor format). This format provides the structure to load 24 hours of meter readings (one per hour) and other data for the attributes of the meter data. Examples of attributes are unit of measure, estimated flag, pulse offset, pulse multiplier, etc. MISO market systems require that the XML file only contain one operating day's data for one asset (i.e. interconnect, generator, or load) or one asset and multiple consecutive operating days' data.

MISO utilizes a programmatic interface to allow for a programmatic upload to the MISO market systems. The programmatic interface uses the web services technology Simple Open Access Protocol (SOAP).

Refer to the MISO Specifications (Section 10.4) for the file format and upload specifications.

[13] Midwest Independent System Operator. "High-level Midwest Market Activities"

4.5.7.2 Comparison

MISO utilizes the same XML file format as the SPP for the meter data. The specifications show that the XML file format differs only in which fields are optional in the XML file. Only minor changes would be needed to account for the fields that are optional.

The existing MDMS database contains all of the structures needed to support the data being sent to MISO.

MISO's programmatic upload is very similar to the SPP programmatic upload. The difference between the two programmatic uploads is minimal (approximately two lines) and changes to MDMS would be minimal as only the MDMS upload component would need to be modified.

4.5.8 PJM Interconnection

The PJM Interconnection (PJM) wholesale electric market was launched in 1997. PJM's market is the largest wholesale electric market in the world[14].

4.5.8.1 Technical Summary

PJM has specified ten XML file formats for submitting meter data and supporting configuration data. Three are file formats for submitting meter data daily and hourly. Two are formats for uploading meter data and two are for the responses from PJM for the upload. One format if for submitting supporting data for the meter configurations and the last two are for submitting monthly corrections to PJM.

The upload processes optionally use the SOAP protocol. If the SOAP wrapper (header information for the transfer) is omitted, no SOAP wrappers are used in any response messages from PJM.

Refer to the PJM Specifications (Section 10.5) for the file format and upload specifications.

4.5.8.2 Comparison

PJM requires ten file formats where MDMS only supports one format (different format than any PJM specified formats). The data required for the file submissions is more extensive which would require adding additional data structures to the MDMS data base. One file submits some calculated values that MDMS cannot currently calculate (applying a loss to a meter).

Due to the number of files that need to be submitted, additional work would be required to update the MDMS upload functionality. Additional work would also be required to handle the archiving of the XML files and the database supporting MDMS. The meter validation and aggregation logic would also require updating to handle any needed calculations.

4.5.9 West Connect

No information could be collected for West Connect. During the initial stages of the research for this topic, West Connect's web site was available but not functioning properly. Broken links and other errors prevented gathering any documentation. As of 10/20/2005, the web site has been

[14] PJM Interconnection, "Market Overview"

taken down. Additionally, links from FERC's web site to the West Connect's web site are no longer functional.

As of 10/23/2005, attempts to contact West Connect directly via email and phone have yielded no results.

5 Findings

There are still regions that have not developed a Regional Transmission Organization (RTO), let alone implement a wholesale electric market. Grid Florida was granted provisional RTO status by FERC in January 2001. To date, Grid Florida has yet to implement a wholesale market and has not been granted full RTO status by FERC. Grid West is currently investigating the formation of an Independent System Operator and has not begun developing a wholesale market design. Information for West Connect was difficult to find and it appears that West Connect is not yet an RTO.

The California Independent System Operator (CAISO) has been operating a wholesale electric market but is currently undergoing a market redesign. The market redesign will be completed in February 2007.

ERCOT follows a model where they act as the control area for the region. This means they poll the meters and do not require a daily submission of meter data.

For the RTO's that do have a wholesale electric market, the technical aspects of the market design vary widely. The overall design of the market, from the business processes involved in the settlement process were similar but the underlying technical implementations were very different.

The only exception to this rule was the similarities between the Southwest Power Pool's (SPP) and Midwest Independent System Operator's (MISO) specifications. SPP has a close relationship to MISO and has emulated MISO's market implementation closely.

File formats for the RTOs were either CSV or an XML format. Each file format was typically unique to each RTO. For RTOs that required the data be submitted by a market participant, at least one file was required for submittal. Some RTOs require multiple files and even configuration data (meter configurations).

File uploads vary from the use of a third party product to programmatic, web service uploads. The upload for each RTO was essentially unique as the specifications have been developed by each RTO. As with the file formats, at least one file could be uploaded but some RTOs allow multiple files to be uploaded. Every RTO provided a web site, typically referred to as the market user interface (MUI). All files can be submitted through the MUI. However, due to the number of files, manual uploads aren't effective for daily data submission.

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6 Conclusions

The research has shown that there are other, viable Regional Transmission Organizations (RTO) that could provide good opportunities for the Meter Data Management System (MDMS).

Provisional RTOs and potential RTOs can be ruled out completely as they have not formed a wholesale electric market. However, it will be important to monitor these regions for further developments in order to determine the feasibility of the MDMS product. These regions are Grid Florida, Grid West and West Connect.

As with provisional or potential RTOs, the California Independent System Operator (CAISO) and the Electric Reliability Council of Texas will both be ruled out. CAISO will be monitored in order to identify any potential opportunities in their market redesign. ERCOT, however, has no need for MDMS with its current feature set.

It was surprise to see how similar the Southwest Power Pool (SPP) and Midwest Independent System Operator (MISO) markets are for the meter data submittal. The differences are practically negligible. MISO's market is new and next steps will be to analyze the MISO membership list to begin developing the list of potential customers and a marketing plan.

The remaining RTOs may be addressed after MISO as MISO presents the most immediate opportunities. Each RTO will be reviewed for potential customers and if warranted, a marketing plan and enhancements to MDMS will be identified and estimated.

The Alberta Electric System Operator (AESO) should be the first to be approached for MDMS. This is due to the relatively simple format of the data files that are needed. The file upload capabilities of MDMS are negated due to there use of a third party product for file transfers. However, the AESO market was implementing in August 2005. The market participants may now need a meter data management system that has some of the data validation and analysis features of MDMS.

The Independent System Operator New England (ISONE) will be monitored and reviewed for any potential customers. ISONE is an older market; it has been operating since 2003. However, the technical aspects of the meter data submittal could be implemented in MDMS.

The PJM Interconnection, which happens to have the largest wholesale electric market, will probably be the most difficult market to approach. PJM's market has been operating since 1997 which could mean all of the market participants have already implemented permanent solutions for the meter data management. PJM also has the most difficult technical requirements as there are several files that need to be generated and uploaded.

7 Suggestions for Additional Work

A market analysis of the Midwest Independent System Operator (MISO) market should be performed to determine the potential customers that are participating in that market.

Time constraints prevented further research of the New York Independent System Operator (NYISO) and the Independent Electricity System Operator (IESO). If wholesale electric markets exist for either Regional Transmission Organization (RTO), the markets need to be researched for the technical feasibility for the MDMS product.

The regions that are currently forming RTOs (Grid Florida, Grid West, and West Connect) need to be monitored for their potential future markets. Staying up-to-date on these RTOs will allow for a quicker market entry should wholesale electric markets be developed.

The California Independent System Operator's (CAISO) market redesign needs to be closely monitored and the technical feasibility of the MDMS product determined.

MISO and PJM Interconnection are working together to develop complementing system operations and one wholesale electric market[15]. This market would be serving customers in 23 states. If market entry for MDMS is successful in the MISO market, the creation of the joint market may identify additional customers. This joint market would also be the largest wholesale electric market in the United States.

A detailed study of market designs, involving the business rules behind the day-ahead, the future transmission rights, and spot markets should be performed. This study would identify potential product solutions that could be developed to expand the iMarket product suite.

[15] Midwest Independent System Operator and PJM Interconnection, "MISO-PJM Joint and Common Market White Paper"

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9 Glossary

The terms in this glossary were compiled using the California Independent System Operator Glossary of Terms and the Federal Energy Regulatory Commission Glossary.

Balancing Authority

The entity that maintains load, generation, and net interchange balance within a Balancing Authority Area and supports interconnection frequency in Real-Time. It replaces the Control Area definition.

Control Area

An electrical region that regulates its generation in order to balance load and maintain planned interchange schedules with other [control areas] and assists in controlling the frequency of the interconnected system in accordance with NERC criteria.

Generator

An entity capable of producing electrical energy.

HTTP

HyperText Transfer Protocol. The de facto standard for transferring documents over the World Wide Web (i.e. Internet).

Independent System Operator (ISO)

The ISO is the FERC regulated control area operator of the ISO transmission grid. Its responsibilities include providing non-discriminatory access to the grid, managing congestion, maintaining the reliability and security of the grid, and providing billing and settlement services. The ISO has no affiliation with any market participant.

Interconnect

The facilities that connect two systems or control areas.

ISO Grid

The combined transmission assets of Transmission Owners that are collectively under the control of the ISO

Load

An end-use device or an end-use customer that receives power from the electric system. Load should not be confused with Demand, which is the measure of power that a Load receives or requires.

Locational Marginal Pricing (LMP)

The price at which supply equals demand at a specified location. All demand which is prepared to pay at least this price at the specified location has been satisfied. All supply which is prepared to operate at or below this price in the specified location has been purchased.

Market Participant

An entity who participates in the electrical energy marketplace through the buying and selling of electrical energy or services.

Market Power

The ability of any market trader with a large market share to significantly control or affect price by withholding production from the market, limiting service availability, or reducing purchases.

NERC

North American Electric Reliability Council. NERC's mission is to ensure that the bulk electric system in North America is reliable, adequate and secure. NERC operates as a self-regulatory organization, relying on reciprocity, peer pressure and the mutual self-interest of all those involved.

Net Scheduled Interchange

The algebraic sum of all scheduled transactions across a given transmission path or between Control Areas for a given period or instant in time.

Operating Day

The date of the scheduled or actual energy flow.

Point of Delivery

A point on the electric system where a power supplier or wheeling entity delivers electricity to the receiver of that energy or to a wheeling entity. This point could include an interconnection with another system or a substation where the transmission provider's transmission and distribution systems are connected to another system.

Point of Receipt

A point on the electrical system where an entity receives electricity from a power supplier or wheeling entity. This point could include an interconnection with another system or generator bus bar.

Regional Transmission Organization

A voluntary organization of transmission owners and users who act as a forum to report to the FERC on the implementation of open access to transmission systems and wholesale electric markets.

Reliability

The degree of performance of the elements of the bulk electric system that results in electricity being delivered to customers within accepted standards and in the amount desired. May be measured by the frequency, duration, and magnitude of adverse effects on the electric supply.

SCADA

Supervisory Control and Data Acquisition. A computer system that allows an electric system operator to remotely monitor and control elements of an electric system

Settlement

A financial settlement process (billing and payment) for products and services purchased and sold; each settlement will involve a price and a quantity.

Wheeling

The use of the transmission facilities of one system to transmit power and energy by agreement for retail or wholesale customers on another system with a corresponding wheeling charge.

10 Appendices

The various RTO market specifications that could be found have been summarized in this appendix.

10.1 SPP Specifications

10.1.1 Meter Data File Format

This table can be found in the SPP Meter Data Submission XML Schema Manual. This is the Lodestar Interval Data Format.

Schema Element Name	Schema Element Description	Data Type	Required
INTERVAL_DATA	INTERVAL_DATA parent element. Parent to: INTERVAL_DATA_FORMAT, VERSION, CUT		Y
INTERVAL_DATA_FORMAT	Lodestar Interval Data Format. Always populate with “LODESTAR Interval Data XML Format”	VARCHAR2(64)	Y
VERSION	XML Version, populate with 1.2		Y
CUT	CUT parent element. Parent to RECORDER, CHANNEL, STARTTIME, STOPTIME, DST_PARTICIPANT, VALIDATION_REQUIRED, PULSE_MULTIPLIER, PULSE_OFFSET, SPI, UOM, TIMEZONE, TIME_ZONE_STANDARD_NAME, TIMESTAMP, ORIGIN, INTERVAL.		Y
RECORDER	Name Identification of the Resource/Asset where the metering is performed: Meter File Type Resource – name of the Resource asset being metered at a Settlement Point. Meter File Type Load – name of the Load being metered at a Settlement Load Zone. Meter File Type Interchange – name of the Settlement Area for which Interchange Meter data is being provided.	VARCHAR2(64)	Y

Schema Element Name	Schema Element Description	Data Type	Required
CHANNEL	The default Channel number is 1 indicating that the Meter data is actual measured Meter data. For Resource and Interchange Meter File types, the Channel is always set to the default. For Load Meter File Types, Meter data will be submitted as Actual Meter data (Channel 1) and Profiled (estimated) Meter data (Channel 2).	NUMBER(5)	Y
STARTTIME	Day and Start time of Meter data. Format as YYYYMM-DDT00:00:00, start of the Operating Day being metered. The date cannot be a future date.	DATE	Y
STOPTIME	Day and Stop time of Meter data. Format as YYYYMM-DDT23:59:59, end of the Operating Day being metered. The date cannot be a future date.	DATE	Y
DST_PARTICIPANT	Day Light Savings Participant flag, default is N, if participating the Flag is set to Y.	VARCHAR2(64)	Y
VALIDATION_REQUIRED	Validation Required Flag, always set to N.	CHAR(1)	Y
PULSE_MULTIPLIER	Always set to 1.	FLOAT(52)	Y
PULSE_OFFSET	Always set to 0.	FLOAT(52)	Y
SPI	Seconds per interval defined by the Market Rules. At market start this value will be 3600.	FLOAT(52)	Y
UOM	Unit of Measure always set to 44 for Mega Watt.		Y
TIMEZONE	Indicates in what time zone the input data is sent. Default setting is 12 for CST. See the Time Zone section for additional Time Zone settings.	VARCHAR2(64)	Y
TIME_ZONE_STANDARD_NAME	Name of time zone that the input data is in. See the Time Zone section for additional Time Zone settings.	VARCHAR2(64)	N

Schema Element Name	Schema Element Description	Data Type	Required
TIMESTAMP	Timestamp is provided by the entity submitting the meter file. The timestamp should indicate when the XML file was created. The portal will append a timestamp to the meter file name to make sure each file name is unique. Format as YYYY-MDDTHH:MM:SS	DATE	Y
ORIGIN	Used to identify what type of data is provided. Not relevant to Market Settlements; however, the following values can be used: "M" - Metered "P" - Profiled "C" - Computed	CHAR (1)	Y
INTERVAL	INTERVAL parent element. Parent to: RECORDING.		Y
RECORDING	RECORDING parent element. Parent to: VALUE, STATUS, START.		Y
VALUE	Meter Actual MWH volume for the interval hour Sign convention - A negative (-) sign indicates a Resource is providing energy onto the grid and for Interchange indicates energy into a Settlement Area.	FLOAT(12,2)	Y
STATUS	Status of the Interval. An empty field or a status of 'A' indicates Actual Meter Data for that interval. "E" in the field indicates that the interval was Estimated. "9" in the field indicates a Missing Interval. Value will be set to zero regardless of value for the interval.	VARCHAR2(64)	Y
START	Date and Time of the Interval Start	DATE	Y

The following is an example of the file format.

```
<INTERVAL_DATA>
	<INTERVAL_DATA_FORMAT>
		LODESTAR Interval Data XML Format
	</INTERVAL_DATA_FORMAT>
	<VERSION>1.2</VERSION>
	<CUT>
		<RECORDER>ABC.UNIT1</RECORDER>
		<CHANNEL>1</CHANNEL>
		<STARTTIME>2005-06-22T00:00:00.000</STARTTIME>
		<STOPTIME>2005-06-22T23:59:59.000</STOPTIME>
		<DST_PARTICIPANT>Y</DST_PARTICIPANT>
		<VALIDATION_REQUIRED>N</VALIDATION_REQUIRED>
		<PULSE_MULTIPLIER>1</PULSE_MULTIPLIER>
```

```
                <PULSE_OFFSET>0</PULSE_OFFSET>
                <SPI>3600</SPI>
                <UOM>44</UOM>
                <TIMEZONE>CST</TIMEZONE>
                <TIME_ZONE_STANDARD_NAME></TIME_ZONE_STANDARD_NAME>
                <TIMESTAMP>2005-08-12T11:08:40.453</TIMESTAMP>
                <ORIGIN>M</ORIGIN>
                <INTERVAL>
                        <RECORDING>
                                <VALUE>20</VALUE>
                                <STATUS>A</STATUS>
                                <START>2005-06-22T00:00:00.000</START>
                        </RECORDING>
                        <RECORDING>
                                <VALUE>20</VALUE>
                                <STATUS>A</STATUS>
                                <START>2005-06-22T01:00:00.000</START>
                        </RECORDING>
                        <RECORDING>
                                <VALUE>20</VALUE>
                                <STATUS>A</STATUS>
                                <START>2005-06-22T02:00:00.000</START>
                        </RECORDING>
                        . . .
                        <RECORDING>
                                <VALUE>10</VALUE>
                                <STATUS>A</STATUS>
                                <START>2005-06-22T04:00:00.000</START>
                        </RECORDING>
                        <RECORDING>
                                <VALUE>10</VALUE>
                                <STATUS>A</STATUS>
                                <START>2005-06-22T05:00:00.000</START>
                        </RECORDING>
                </INTERVAL>
        </CUT>
</INTERVAL_DATA>
```

10.1.2 File Upload

The following table can be found in the COS Programmatic Upload specification. This table shows the Schema Elements for the SPP programmatic upload.

Schema Element Name	Element Description	Required
ns1:service	This tag describes the service for the PI to perform. Tag must contain the value “upload”.	Y
ns1:file	This is a repeating tag. Each instance of this tag contains the XML file a user is attempting to upload. The <ns1:file> tag requires the attribute “xmlns” which is the name of said file. The data inside the tag must be wrapped in a CDATA tag as follows:	Y

Schema Element Name	Element Description	Required
	<![CDATA[<xml/>]]>	

The following is an example of the SOAP message. This example includes the "wrapper" and the meter data format (above).

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope
xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
<soapenv:Body>
      <ns1:service mlns:ns1="blank">upload</ns1:service>
      <ns2:file xmlns:ns2="CSWE_valid_Asset_Rel.xml"><![CDATA[
      <INTERVAL_DATA>
            <INTERVAL_DATA_FORMAT>
                  LODESTAR Interval Data XML Format
            </INTERVAL_DATA_FORMAT>
            <VERSION>1.2</VERSION>
            <CUT>
                  <RECORDER>CSWE_LSE11</RECORDER>
                  <CHANNEL>1</CHANNEL>
                  <STARTTIME>2004-11-13T00:00:00.000</STARTTIME>
                  <STOPTIME>2004-11-13T23:59:59.000</STOPTIME>
                  <DST_PARTICIPANT>N</DST_PARTICIPANT>
                  <VALIDATION_REQUIRED>Y</VALIDATION_REQUIRED>
                  <PULSE_OFFSET>0</PULSE_OFFSET>
                  <SPI>3600</SPI>
                  <UOM>44</UOM>
                  <TIMEZONE>12</TIMEZONE>
                  <TIME_ZONE_STANDARD_NAME/>
                  <TIMESTAMP>2003-10-01T11:07:19.000</TIMESTAMP>
                  <ORIGIN>C</ORIGIN>
                  <INTERVAL>
                        <RECORDING>
                              <VALUE>195</VALUE>
                              <STATUS> </STATUS>
                              <START>2003-10-01T23:00:00.000</START>
                        </RECORDING>
                  </INTERVAL>
            </CUT>
      </INTERVAL_DATA>]]>
      </ns2:file>
</soapenv:Body>
</soapenv:Envelope>
```

The following table can be found in the COS Programmatic Upload specification. This table shows the Schema Elements for the programmatic upload response.

Schema Element Name	Schema Element Description	Required
ns1:service	This tag describes the service for the PI to perform.	Y

	Tag must contain the value “validate”.	
ns1:file	This is a repeating tag. Each instance of this tag contains the XML file a user is attempting to validate. The <ns1:file> tag requires the attribute “xmlns” which is the name said file. The data inside the tag must be wrapped in a CDATA tag as follows: <![CDATA[<xml/>]]>	Y

The following is an example of the SPP programmatic interface response to the above SOAP message.

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope
   xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
   xmlns:xsd="http://www.w3.org/2001/XMLSchema"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
<soapenv:Body>
      <ns1:uploadResponse xmlns:ns1="uploadReturn"><![CDATA[
            <FILE_LIST>
                  <FILE LOADED=yes>
                  <NAME>CSWE_valid_AsseT1102953244254..xml</NAME>
                  </FILE>
            </FILE_LIST>]]>
      </ns1:uploadResponse>
</soapenv:Body>
</soapenv:Envelope>
```

10.2 AESO Specifications

All date/time formats below are “YYYYMMDDHHMISS”. Where:

- YYYY-Year with century
- MM-2 digit month (01-12)
- DD-2 digit day (01-31)
- HH-24 hour clock (00-23)
- MI-minutes (00-59)
- SS-seconds (00-59)

10.2.1 Daily Interval Meter File Format

This file is used to submit daily, individual meter data.

Element (in Sequence)	Data Type/Size	Description
Transaction Abbreviation	“DIM”	Abbreviation for the transaction name. Daily Interval Meter
Transaction Date & Time	Date time format	Latter of the time the transaction was created or last modified.

Element (in Sequence)	Data Type/Size	Description
MDM ID	MDM ID format	Sender (Meter Data Manager responsible to read the meter). The 4-digit number that uniquely represents each Meter Data Management company operating within Alberta.
Retailer ID	Retailer ID format	Recipient (Retailer currently associated to the Site). A 9-digit number that uniquely represents each retailer operating within Alberta. Assigned by AESO when the participant is approved for pool participant status.
Business Function ID	Varchar(2)	Optional at the discretion of the wire services provider (transmission provider).
Settlement ID	Settlement ID format	Recipient (Load Settlement Agent responsible to settle the load within the Zone). The 4-digit number that uniquely represents each Load Settlement Agent operating within Alberta.
Site ID	Site ID format	Site ID format – WiresID99999999Chk, where: • WiresID – Wires Company ID (0010) (transmission provider) • 99999999 – Site ID that each transmission provider can administer as they see fit. (Site ID is the identifier for a metering point). • Chk – Single check digit formed as a Mod 9 of the prior numbers. Mod 9 will provide a check digit value between 0 and 8.
Socket ID	Socket ID format	Socket ID format – 99999999. A Site may be made up of more than one Socket.
Load Research Flag	Character(1)	A Yes or No flag noting a customer in the load research sample.
Profiling Class	Varchar(20)	The customer's load profiling class.
kW	Number(10,4)	Kilowatt demand for the interval period.
kWh	Number(10,4)	Kilowatt hour consumption for the interval period.

Element (in Sequence)	Data Type/Size	Description
kVA	Number(10,4)	Kilovolt-ampere (Demand) for the interval period.
kVAh	Number(10,4)	Kilovolt-ampere hour (Consumption) for the interval period.
kVAR	Number(10,4)	Kilovolt-ampere Reactive (Demand) for the interval period.
kVARh	Number(10,4)	Kilovolt-ampere Reactive hour (Consumption) for the interval period.
Datetime	Datetime format	END Date and Time for the reading.
Interval Period	Number(4)	Number of minutes between readings
Hour Ending	Char(3)	See definition. Third character is to be used for asterisk as described in the definition, but otherwise blank.
Demand (KW) Status	Char(2)	Describes the type of meter reading. ME-Actual from meter ES-Estimated
Consumption (kWh) Status	Char(2)	Describes the type of meter reading. ME-Actual from meter ES-Estimated
Demand (kVA) Status	Char(2)	Describes the type of meter reading. ME-Actual from meter ES-Estimated
Demand (kVAh) Status	Char(2)	Describes the type of meter reading. ME-Actual from meter ES-Estimated
Demand (kVAR) Status	Char(2)	Describes the type of meter reading. ME-Actual from meter ES-Estimated
Demand (kVARh) Status	Char(2)	Describes the type of meter reading. ME-Actual from meter ES-Estimated
Transaction Status Code	Char(4)	Used by the recipient to notify the sender of problems with the transaction. When this field is used it must be dealt with at a minimum, in a manual fashion. The use of this electronic transaction in an automated fashion (in case of problems) is subject to the Terms and Conditions. Transaction codes defined in the Settlement System Code documentation in Section B.9.

10.2.2 Daily Cumulative Meter File Format

This file format is used to submit cumulative daily meter data.

Element (in Sequence)	Data Type/Size	Description
Transaction Abbreviation	"DCM"	Abbreviation for the transaction name. Daily Cumulative Meter
Transaction Date & Time	Date time format	Latter of the time the transaction was created or last modified.
MDM ID	MDM ID format	Sender (Meter Data Manager responsible to read the meter). The 4-digit number that uniquely represents each Meter Data Management company operating within Alberta.
Retailer ID	Retailer ID format	Recipient (Retailer currently associated to the Site). A 9-digit number that uniquely represents each retailer operating within Alberta. Assigned by AESO when the participant is approved for pool participant status.
Business Function ID	Varchar(2)	Optional at the discretion of the wire services provider (transmission provider).
Settlement ID	Settlement ID format	Recipient (Load Settlement Agent responsible to settle the load within the Zone). The 4-digit number that uniquely represents each Load Settlement Agent operating within Alberta.
Site ID	Site ID format	Site ID format – WiresID99999999Chk, where: • WiresID – Wires Company ID (0010) (transmission provider) • 99999999 – Site ID that each transmission provider can administer as they see fit. (Site ID is the identifier for a metering point). • Chk – Single check digit formed as a Mod 9 of the prior numbers. Mod 9 will provide a check digit value between 0 and 8.
Socket ID	Socket ID format	Socket ID format – 99999999. A Site may be made up of more than one Socket.
Meter Number	Varchar(20)	Meter number.

Element (in Sequence)	Data Type/Size	Description
kWh	Number(8,2)	Kilowatt hour consumption for period.
Max kVA	Number(8,2)	Demand in Kilovolt Amps for period.
Max kW	Number(8,2)	Kilowatt demand for period.
Last Reading Datetime	Datetime format	Date and time of the last reading.
Current Reading Datetime	Datetime format	Date and time of the current reading.
Last Meter Dial Reading	Number(10)	The previous dial reading taken from the meter.
Current Meter Dial Reading	Number(10)	The current dial reading taken from the meter.
Max Reading (Watt)	Number(5)	Used to derive the demand in kW. For example, if max reading = 100 and the multiplier = 200, kW = (100x200)/1000 = 20.
Max Reading (Voltamp)	Number(5)	Used to derive the demand in kVA. For example, if max reading = 100 and the multiplier = 200, kVA = (100x200)/1000 = 20.
Meter Multiplier	Number(6,1)	Meter multiplier.
Consumption (kWh) Status	Char(2)	Describes the type of meter reading. • ME-Passed validation tests as described in Appendix B.4.2.1 (Settlement System Code). • VE-Failed validation tests. • ES-Estimated based on methodology outlined in Appendix B.4.2.2.c (Settlement System Code)
Demand (kVA) Status	Char(2)	Describes the type of meter reading. • ME-Passed validation tests as described in Appendix B.4.2.1 (Settlement System Code). • VE-Failed validation tests. • ES-Estimated based on methodology outlined in Appendix B.4.2.2.c (Settlement System Code)
Demand (kW) Status	Char(2)	Describes the type of meter reading. • ME-Passed validation tests as described in Appendix B.4.2.1 (Settlement System Code). • VE-Failed validation tests. • ES-Estimated based on methodology outlined in Appendix B.4.2.2.c (Settlement System Code)

Element (in Sequence)	Data Type/Size	Description
Record Status	Char(2)	CA-Cancelled. This code indicates that the receiver should cancel their version of this exact record. Sending this record eliminates confusion of the records purpose; especially when the replacement record may not cover the same period as this cancelled record.
Transaction Status Code	Char(4)	Used by the recipient to notify the sender of problems with the transaction. When this field is used it must be dealt with at a minimum, in a manual fashion. The use of this electronic transaction in an automated fashion (in case of problems) is subject to the Terms and Conditions. Transaction codes defined in the Settlement System Code documentation in Section B.9.

10.3 ISONE Specifications

10.3.1 Meter Data File Format

This table can be found in the Independent System Operator New England. “SMD Metering Upload File Format”.

Field	Description	Format	Required
Component	Defines the type of upload file. The type should be Meter for Generator, Load, Tie Line meter readings, or for Interruptible Load readings.	Specify : METER (case sensitive)	Yes
File Type	Contains the interval period of the meter readings.	Specify : DAILY (case sensitive).	Yes
Asset CustomerId	Contains the customer’s identification number.	Maximum length is 9 characters.	Yes
AssetId	Contains the identification number of a Market System Asset.	Maximum length is 9 characters.	Yes
AssetType	Contains one of the following categories that describe the type of asset it is: Unit, Tie Line, and Load.	Use one from the description column (not case sensitive).	Yes
Date	Contains the applicable date for this data.	MM/DD/YYYY	Yes
Hour Ending	Contains the given ending hour that the meter reading was taken.	Numeric from 1 – 24 (daylight-saving extra hour = 2*). For April short day hour 0200 does not exist.	Yes

MWAmount	Contains the meter reading data for the given ending hour, that is a decimal number, or the word “null” (not case sensitive).	Total length cannot exceed 10 characters but includes up to 3 decimals. In lieu of a numeric metered value, the word “null” (not case sensitive) can be submitted	Yes, for Meter Component

The following is an example of the XML format for the meter data.

```
<?xml version="1.0" encoding="ISO-8859-1" ?>
<!DOCTYPE MeteringData PUBLIC '-//ISO New England, Inc//DTD Metering
   Submission 1.0//EN' 'http://www.iso-
   ne.com/smd/dtd/sms/MeteringData_1_0.dtd'>
<MeteringData Component="METER" FileType="DAILY" >
      <Asset CustomerId="5" AssetId="1010" AssetType="INTERRUPTIBLE
      LOAD" Date="03/10/2005" >
      <MeterReading>
            <HourReading HourEnding="1" MWAmount="" />
            <HourReading HourEnding="2" MWAmount="" />
            <HourReading HourEnding="3" MWAmount="" />
            <HourReading HourEnding="4" MWAmount="" />
            <HourReading HourEnding="5" MWAmount="" />
            <HourReading HourEnding="6" MWAmount="" />
            <HourReading HourEnding="7" MWAmount="" />
            <HourReading HourEnding="8" MWAmount="" />
            <HourReading HourEnding="9" MWAmount="NULL" />
            <HourReading HourEnding="10" MWAmount="NULL" />
            <HourReading HourEnding="11" MWAmount="1.35" />
            <HourReading HourEnding="12" MWAmount="1.35" />
            <HourReading HourEnding="13" MWAmount="1.35" />
            <HourReading HourEnding="14" MWAmount="1.35" />
            <HourReading HourEnding="15" MWAmount="1.35" />
            <HourReading HourEnding="16" MWAmount="1.35" />
            <HourReading HourEnding="17" MWAmount="" />
            <HourReading HourEnding="18" MWAmount="" />
            <HourReading HourEnding="19" MWAmount="" />
            <HourReading HourEnding="20" MWAmount="" />
            <HourReading HourEnding="21" MWAmount="" />
            <HourReading HourEnding="22" MWAmount="" />
            <HourReading HourEnding="23" MWAmount="" />
            <HourReading HourEnding="24" MWAmount="" />
        </MeterReading>
    </Asset>
</MeteringData>
```

10.3.2 File Upload

ISONE’s file upload process emulates a web browser and has specific steps required to upload the file.

The following specifications highlight the process.

Client Login:

1. Request URL: "https://smd.iso-ne.com/sms_oper_contract/main"
   Request method: GET
   Response code: 302
   Response Location header: "https://smd.iso-ne.com/sms_oper_contract/requestor.jsp"
   Response Set-Cookie header: "JSESSIONID=<*JSESSIONID*>; path=/..."

2. Request URL: "https://smd.iso-ne.com/sms_oper_contract/main"
   Request method: POST
   Request Cookie header: *<JSESSIONID>*
   Request Content-Type header: "application/x-www-form-urlencoded"
   Request post data (without newlines):

   ```
   searh_type=by_ID
   &search_criteria=
   &Find=Find
   &servlet_action=SEARCH_PARTY
   ```

   Response code: 200
   Response data contains:

   ```
   ...
   <a onClick="return(setPartyID(represented party number,party
   name));">
   ...
   ```

3. Request URL: "https://smd.iso-ne.com/sms_oper_contract/main"
   Request method: POST
   Request Cookie header: *<JSESSIONID>*
   Request Content-Type header: "application/x-www-form-urlencoded"
   Request post data (without newlines):

   ```
   requestor_name=<represented party name>
   &requestor_party=<party number>
   &servlet_action=REQUESTOR_ASSIGN
   ```

   Response code: 200
   Response data contains:

   ```
   ...
   <td>Search For Existing Contract... User: <represented party
   name>
   ...
   ```

Client Upload (must follow the login)

1. Request URL: "https://smd.iso-ne.com/sms_oper_contract/main"
   Request method: POST
   Request Cookie header: *<JSESSIONID>*
   Request Content-Type header: "multipart/form-data; boundary=*<boundary string>*"
   Request post data (with newlines):

   ```
   --<boundary string>
   Content-Disposition: form-data; name="file"; filename="<name of
   contract upload XML file>"
   Content-Type: text/xml

   <body of contract upload XML file>

   --<boundary string>--
   ```

   Response code: 200
   Response data for successful upload contains:

   ```
   ...
   <table>
     <tr><td><b>Files successfully uploaded:</b></td></tr>
       <ul>
         <tr><td><li><name of contract upload XML
   file></li></td></tr>
   ...
   ```

Response data for unsuccessful upload contains:

```
...
<table>
  <tr><td><b>Files failed to upload:</b></td></tr>
    <ul>
      <tr><td><li><name of contract upload XML
file></li></td></tr>
...
Error messages:
<textarea>
 <Error messages for user>
```

10.4 MISO Specifications

10.4.1 Meter Data Format

The following table can be found in the Midwest Independent System Operator, "Volume 5 – COS XML Interface Reference. This table details the Lodestar Interval Data format for the meter data.

Schema Element Name	Schema Element Description	Data Type	Required
INTERVAL_DATA	INTERVAL_DATA parent element. Parent to: INTERVAL_DATA_FORMAT, VERSION, CUT		Y
INTERVAL_DATA_FORMAT	Lodestar Interval Data Format. Not required but reserved for possible future use.	VARCHAR2(64)	N
VERSION	XML Version. Not required but reserved for possible future use.		N
CUT	CUT parent element. Parent to RECORDER, CHANNEL, STARTTIME, STOPTIME, DST_PARTICIPANT, VALIDATION_REQUIRED, PULSE_MULTIPLIER, PULSE_OFFSET, SPI, UOM, TIMEZONE, TIME_ZONE_STANDARD_NAME, TIMESTAMP, ORIGIN, INTERVAL. Must not be repeated within INTERVAL_DATA parent element.		Y
RECORDER	Name Identification of the Resource/Asset where the metering is performed:	VARCHAR2(64)	Y
CHANNEL	Not required but reserved for possible future use.	NUMBER(5)	N

Schema Element Name	Schema Element Description	Data Type	Required
STARTTIME	Day and Start time of Meter data. Has to be in Eastern Standard Time (EST). Format as YYYY-MM-DDT00:00:00, start of the Operating Day being metered. This date cannot be a future date.	DATE	Y
STOPTIME	Day and Stop time of Meter data. Format as YYYYMM-DDT23:59:59, end of the Operating Day being metered. The date cannot be a future date.	DATE	Y
DST_PARTICIPANT	Day Light Savings Participant flag. Not required. Reserved for possible future use. Currently, the Midwest ISO will always set this value to 'N', Indicating no Daylight Savings Participation	VARCHAR2(64)	N
VALIDATION_REQUIRED	Validation Required Flag. Not required. Reserved for possible future use.	CHAR(1)	N
PULSE_MULTIPLIER	Not required. Reserved for possible future use.	FLOAT(52)	N
PULSE_OFFSET	Not required. Reserved for possible future use.	FLOAT(52)	N
SPI	Seconds per interval defined by the Market Rules. At market start this value will be 3600.	FLOAT(52)	Y
UOM	Unit of Measure always set to 44 for Mega Watt.		Y
TIMEZONE	Not required. Reserved for possible future use. Currently, the Midwest ISO will always set this value to 10, indicating EST.	VARCHAR2(64)	N
TIME_ZONE_STANDARD_NAME	Not required. Reserved for possible future use.	VARCHAR2(64)=	N
TIMESTAMP	Not required. Reserved for possible future use.	DATE	N
ORIGIN	Not required. Reserved for possible future use.	CHAR (1)	N
INTERVAL	INTERVAL parent element. Parent to: RECORDING.		Y

Schema Element Name	Schema Element Description	Data Type	Required
RECORDING	RECORDING parent element. Parent to: VALUE, STATUS, START.		Y
VALUE	Meter Actual MW volume for the interval hour. Decimal values accepted up to the KW (provided values will be truncated to three decimal places)	FLOAT(10,3)	Y
STATUS	Status of the Interval. This value is not required. If not provided, the Midwest ISO assumes the value is actual meter data; however, if provided, only the following values will be allowed: • An empty field indicates Actual Meter Data for that interval. • 'E' indicating that Estimated values. Any value other than these will be changed to space (empty field).	VARCHAR2(64)	N
START	Date and Time of the Interval Start. Has to be in Eastern Standard Time (EST). Format as YYYY-MM-DDTHH24:00:00 Examples: 2002-02-01T00:00:00 (For the first hour) 2002-02-01T23:00:00 (For the last hour) This tag is not required and is for the user's own viewing purposes. This value will not be used to match the interval value with the hour provided when loading the meter values. The sequential order of the intervals will determine the hour that corresponds to each interval.	DATE	N
DESCRIPTOR	Reserved space for internal use.	VARCHAR264	N

Following is an example of the XML file.

```
<INTERVAL_DATA>
      <INTERVAL_DATA_FORMAT>
            LODESTAR Interval Data XML Format
      </INTERVAL_DATA_FORMAT>
      <VERSION>1.2</VERSION>
      <CUT>
```

```
                <RECORDER>CNODE1</RECORDER>
                <CHANNEL>1</CHANNEL>
                <STARTTIME>2005-06-22T00:00:00.000</STARTTIME>
                <STOPTIME>2005-06-22T23:59:59.000</STOPTIME>
                <DST_PARTICIPANT>Y</DST_PARTICIPANT>
                <VALIDATION_REQUIRED>N</VALIDATION_REQUIRED>
                <PULSE_MULTIPLIER>1</PULSE_MULTIPLIER>
                <PULSE_OFFSET>0</PULSE_OFFSET>
                <SPI>3600</SPI>
                <UOM>44</UOM>
                <TIMEZONE>CST</TIMEZONE>
                <TIME_ZONE_STANDARD_NAME></TIME_ZONE_STANDARD_NAME>
                <TIMESTAMP>2005-08-12T11:08:40.453</TIMESTAMP>
                <ORIGIN>M</ORIGIN>
                <INTERVAL>
                        <RECORDING>
                                <VALUE>20</VALUE>
                                <STATUS>A</STATUS>
                                <START>2005-06-22T00:00:00.000</START>
                        </RECORDING>
                        <RECORDING>
                                <VALUE>20</VALUE>
                                <STATUS>A</STATUS>
                                <START>2005-06-22T01:00:00.000</START>
                        </RECORDING>
                        <RECORDING>
                                <VALUE>20</VALUE>
                                <STATUS>A</STATUS>
                                <START>2005-06-22T02:00:00.000</START>
                        </RECORDING>
                        . . .
                        <RECORDING>
                                <VALUE>10</VALUE>
                                <STATUS>A</STATUS>
                                <START>2005-06-22T04:00:00.000</START>
                        </RECORDING>
                        <RECORDING>
                                <VALUE>10</VALUE>
                                <STATUS>A</STATUS>
                                <START>2005-06-22T05:00:00.000</START>
                        </RECORDING>
                </INTERVAL>
        </CUT>
</INTERVAL_DATA>
```

10.4.2 File Upload

The following table can be found in the Midwest Independent System Operator, “Volume 4 - COS Programmatic Interface Reference”. This table details the upload format for a programmatically uploaded file.

Schema Element Name	Schema Element Description	Data Type	Required
ns1:upload	This is an instruction to the PI to perform the upload action. This element requires the following two attributes: xmlns:ns1="urn:settlement:cos_md" xmlns="urn:settlement:cos_md" This parent tag requires the following child element: <files>		
files	This tag contains the XML files a user is attempting to upload. The <files> tag requires the child element <item> and it can contain one or many of the <item> elements.		
item	This is a repeating tag. Each instance of this tag holds the contents of an individual meter file. This element does not require any attributes. This element requires the following two child elements: <key> and <value>		
key	This element represents the filename of the meter data file. The value of this element can only contain letters, numbers, dashes, periods and underscores. No other special characters will be allowed or the meter data file will be rejected.		

Schema Element Name	Schema Element Description	Data Type	Required
value	This element contains the meter data. This element may optionally contain the following attribute: xsi:type="xsd:string" The Meter Data Schema Description can be located in the Midwest Market Website. The document is called "Volume 5 – COS XML Interface" and is located at: http://www.midwestmarket.org/Docs/TechnicallDocuments.htm		

The following is an example of the SOAP "wrapper" used for the file upload to MISO.

```
<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope xmlns:SOAP-
   ENV="http://schemas.xmlsoap.org/soap/envelope/"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
   xmlns:xsd="http://www.w3.org/2001/XMLSchema">
<SOAP-ENV:Body>
      <ns1:upload xmlns:ns1="urn:settlement:cos_md"
      xmlns="urn:settlement:cos_md">
      <files>
      <item>
      <key xsi:type="xsd:string">3_6_2003_GENRES_GENRES1.xml</key>
      <value xsi:type="xsd:string">
            <?xml version="1.0" encoding="iso-8859-1"?>
                  …
                  …
                  …
      </value>
      </item>
      </files>
      </ns1:upload>
</SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

The following table can be found in the Midwest Independent System Operator, "Volume 4 - COS Programmatic Interface Reference". This table details the MISO response to a programmatically uploaded file.

Name	Schema Element Description	Data Type	Required
ns1:uploadResponse	This is the deployment descriptor. This parent tag requires the following two attributes: xmlns:ns1="urn:settlement:cos_md" xmlns="urn:settlement:cos_md" This parent tag requires the following child element: <uploadReturn>		

Name	Schema Element Description	Data Type	Required
uploadReturn	This contains the string sent back to the client.		
FILE_LIST	Response parent element having element : FILE		
FILE	Parent element containing the response to each meter file upload. It can have the following child elements: NAME, ERROR. And COMMENTS. It also contains the attribute LOADED		Y
LOADED	Attribute of the FILE tag. Its allowed values are either “yes” or “no”		N
NAME	Name of the file being uploaded.	VARCHAR2(64)	Y
COMMENTS	Comments associated to the meter upload.	VARCHAR2(254)	N
ERROR	Parent element for error generated for file having element: DESCRIPTION.	VARCHAR2()	N
DESCRIPTION	Description of error generated for file being uploaded.	VARCHAR2(254)	N

The following is an example of the MISO programmatic interface response to the above SOAP message.

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope
   xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
   xmlns:xsd="http://www.w3.org/2001/XMLSchema"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
<soapenv:Body>
      <ns1:uploadResponse xmlns:ns1="uploadReturn"><![CDATA[
            <FILE_LIST>
                  <FILE LOADED=yes>
                  <NAME>NPPD_1102953244254.xml</NAME>
                  </FILE>
            </FILE_LIST>]]>
      </ns1:uploadResponse>
</soapenv:Body>
</soapenv:Envelope>
```

10.5 PJM Specifications

The following files have been specified by PJM.

All dates below are formatted as “MM/DD/YYYY”. Where:

- YYYY-Year with century
- MM-2 digit month (01-12)
- DD-2 digit day (01-31)
- HH-24 hour clock (00-23)
- MI-minutes (00-59)

- SS-seconds (00-59)

10.5.1 Interval Definition Element

This element is included in most of the file formats. The element structure follows.

Name	Element Description	Data Type
interval_definition	Root element of the interval definition.	N/A
interval_start	Child element to interval_definition. Typically optional. Occastionally required if interval_definition included in file.	N/A
hour	Child element to interval_start.	Number(2) - Zero pad to left.
time_zone	Child element to interval_start	Char(3).
date	Child element to interval_start. Date of meter data.	Date
interval_end	Child element to interval_definition. Required.	N/A
hour	Child element to interval_end. Required.	Number(2) - Zero pad to left.
time_zone	Child element to interval_end Required	Char(3).
date	Child element to interval_end. Date of meter data. Required.	Date

10.5.2 Daily Load Submission

This file is for load submissions.

Name	Element Description	Data Type
emtr_load	Root element for XML hierarchy	N/A
actual_nmi	Child of root element. Optional.	N/A
actual_nmi_value	Child element to actual_nmi. Required if actual_nmi in file.	Number
interval_definition	Child of the actual_nmi_value. See 10.5.1.	N/A
mw_values	Child element to actual_nmi_value.	Number
total_internal_gen	Child of root element. Optional.	N/A
total_internal_gen_value	Child of total_internal_gen element. At least one required if total_internal_gen in file.	N/A

Name	Element Description	Data Type
interval_definition	Child element to total_internal_gen_value. See 10.5.1.	N/A
mw_values	Child element to total_internal_gen_value.	Number
share_losses	Child of root element. Optional.	N/A
share_losses_value	Child element to share_losses. At least one required if share_losses in file.	N/A
interval_definition	Child element to share_losses_value. Required. See 10.5.1.	N/A
mw_values	Child element to share_losses_value.	Number
calculated_load	Child to root element. Optional	N/A
load_value	Child element to calculated_load. At least one required if calculated_load in file.	N/A
interval_definition	Child element to load_value. Required.	N/A
mw_values	Child element to load_value. See 10.5.1.	Number
zone_submitted_load	Child to root element. Optional, zero or more can be included in file.	N/A
zone_id	Child to zone_submitted_load element. Required if zone_submitted_load included in file. Identifier for settlement location (or zone).	Number
zone_name	Child to zone_submitted_load element. Required if zone_submitted_load included in file. Name of settlement location (or zone).	Varchar(15)
submitted_value	Child to zone_submitted_load element. Required if zone_submitted_load included in file.	N/A
interval_definition	Child to submitted_value element. Required. See 10.5.1.	N/A
mw_values	Child element to submitted_value.	Number
company_submitted_load	Child to root element. Optional, zero or more can be include in file.	N/A
submitted_value	Child to company_submitted_load element. Required if company_submitted_load included in file.	N/A
interval_definition	Child to submitted_value element. Required. See 10.5.1.	N/A
mw_values	Child element to submitted_value.	Number

10.5.3 Daily MV Allocation

This file is for MV Allocations.

Name	Element Description	Data Type
emtr	Root element for XML hierarchy	N/A
meter_account	Child of root element. Required, one or more.	N/A
meter_account_id	Child element to meter_account. Required.	N/A
counter_party	Child element to meter_account. Optional. Any other party that is allowed access to this data.	Varchar
name	Child element to meter_account. Required. Name of account.	Varchar
meter_type	Child element to meter_account. Required. Type of meter (generation, load, interconnect/tie).	Varchar
allocated_values	Child element to meter_account. Required, one or more.	N/A
interval_definition	Child element to allocated_values. See 10.5.1.	N/A
mw_values	Child element to allocated_values.	Number
actual_nmi	Child of root element. Required.	N/A
actual_nmi_value	Child element to actual_nmi. Required.	Number
interval_definition	Child element to actual_nmi_value. See 10.5.1.	N/A
mw_values	Child element to actual_nmi_value.	Number
tga	Child of root element. Required.	N/A
tga_value	Child of tga element. Required, one or more.	N/A
interval_definition	Child element to tga_value. Required if total_internal_gen_value in file. See 10.5.1.	N/A
mw_values	Child element to tga_value.	Number
adjusted_nmi	Child of root element. Required.	N/A
adjusted_nmi_value	Child element to adjusted_nmi. Required.	Number
interval_definition	Child element to adjusted_nmi_value. See 10.5.1.	N/A
mw_values	Child element to adjusted_nmi_value.	Number
share_losses	Child of root element. Optional.	N/A
text	Child element to share_losses. Required if share_losses included in file.	

Name	Element Description	Data Type
share_losses_value	Child element to share_losses. Optional.	N/A
interval_definition	Child element to share_losses_value. Required if share_losses_value in file. See 10.5.1.	N/A
mw_values	Child element to share_losses_value.	Number
share_inadvertant	Child of root element. Optional.	N/A
text	Child element to share_inadvertant. Required if share_inadvertant included in file.	
share_inadvertant_value	Child element to share_inadvertant. Optional.	N/A
interval_definition	Child element to share_inadvertant_value. Required if share_inadvertant_value in file. See 10.5.1.	N/A
mw_values	Child element to share_losses_value.	Number

10.5.4 Daily MV Submission

The file is for daily meter value submissions.

Name	Element Description	Data Type
emtr	Root element for XML hierarchy	N/A
meter_account	Child of root element. Required, one or more.	N/A
meter_account_id	Child element to meter_account. Required.	N/A
name	Child element to meter_account. Required. Name of account.	Varchar
counter_party	Child element to meter_account. Required. Any other party that is allowed access to this data.	Varchar
meter_type	Child element to meter_account. Required. Type of meter (generation, load, interconnect/tie).	Varchar
ehv	Child element to meter_account. Required.	Varchar
meter_values	Child element to meter_account. Optional, zero or more.	N/A
interval_definition	Child element to meter_values. See 10.5.1. interval_start element required for this format,	N/A
mw_values	Child element to meter_values.	Number
total_loss	Child of root element. Optional, zero or more.	N/A
control_area_name	Atribute of total_loss. Valid values are CE, PJM-E, PJM-W, PJM. Required if total_loss in file.	Varchar

Name	Element Description	Data Type
loss_values	Child element to total_loss.	N/A
interval_definition	Child element to loss_values. Optional. See 10.5.1. interval_start element required for this format,.	N/A
loss_amount	Child element to loss_values.	Number
total_inadvertant	Child of root element. Optional, zero or more.	N/A
control_area_name	Atribute of total_loss. Valid values are CE, PJM-E, PJM-W, PJM. Required if total_inadvertant in file.	Varchar
inadvertant_values	Child element to total_inadvertant.	N/A
interval_definition	Child element to inadvertant_values. Optional. See 10.5.1. interval_start element required for this format,	N/A
inadvertent_amount	Child element to loss_values.	Number
total_losses_east	Child of root element. Optional.	N/A
loss_values	Child element to total_losses_east.	N/A
interval_definition	Child element to loss_values. Optional. See 10.5.1. interval_start element required for this format,	N/A
loss_amount	Child element to loss_values.	Number
total_losses_west	Child of root element. Optional.	N/A
loss_values	Child element to total_losses_west.	N/A
interval_definition	Child element to loss_values. Optional. See 10.5.1. interval_start element required for this format,	N/A
loss_amount	Child element to loss_values.	Number
total_inadvertant_east	Child of root element. Optional, zero or more.	N/A
inadvertant_values	Child element to total_inadvertant_east.	N/A
interval_definition	Child element to inadvertant_values. Optional. See 10.5.1. interval_start element required for this format,	N/A
inadvertent_amount	Child element to loss_values.	Number
total_inadvertant_west	Child of root element. Optional, zero or more.	N/A
inadvertant_values	Child element to total_inadvertant_west.	N/A
interval_definition	Child element to inadvertant_values. Optional. See 10.5.1. interval_start element required for this format,	N/A
inadvertent_amount	Child element to loss_values.	Number

10.5.5 Meter Data Upload

The file is for programmatic daily meter data uploads.

Name	Element Description	Data Type
emtr	Root element for XML hierarchy	N/A
meter_account	Child of root element. Required, one or more.	N/A
meter_account_id	Child element to meter_account. Required.	N/A
meter_values	Child element to meter_account. Optional, zero or more.	N/A
interval_definition	Child element to meter_values. See 10.5.1. interval_start element required for this format,	N/A
mw_values	Child element to meter_values.	Number

10.5.6 Meter Data Upload Response

This file is the programmatic response from PJM for the Meter Data Upload (Section 10.5.5).

Name	Element Description	Data Type
emtr	Root element for XML hierarchy	N/A
result	Child of root element. Required, one or more.	N/A
meter_account_id	Child element to result. Required.	Number
upload_status	Child element to result. Required. Indicates successful or failed upload for the meter account.	Varchar
description	Child element to result. Required, one or more. Description of failure.	Varchar

10.5.7 Load Data Upload

The file is for programmatic daily load data uploads.

Name	Element Description	Data Type
emtr	Root element for XML hierarchy	N/A
load	Child of root element. Required, one or more.	N/A
zone_id	Child element to load. Required. Identifier for the load zone.	Number
load_values	Child element to load. Required, one or more.	N/A
interval_definition	Child element to meter_values. See 10.5.1. interval_start element required for this format,	N/A

Name	Element Description	Data Type
mw_values	Child element to meter_values.	Number

10.5.8 Load Data Upload Response

This file is the programmatic response from PJM for the Load Data Upload (Section 10.5.5).

Name	Element Description	Data Type
emtr_load	Root element for XML hierarchy	N/A
result	Child of root element. Required, one or more.	N/A
name	Child element to result. Required.	Varchar
zone_id	Child element to result. Required. Identifier for the load zone.	Number
upload_status	Child element to result. Required. Indicates successful or failed upload for the meter account.	Varchar
description	Child element to result. Required, one or more. Description of failure.	Varchar

10.5.9 Meter Accounts

The file is for the meter account configurations.

Name	Element Description	Data Type
emtr	Root element for XML hierarchy	N/A
meter_account	Child of root element. Required, one or more.	N/A
meter_account_id	Child element to meter_account. Required. Identifier for the meter.	Number
meter_account_name	Child element to meter_account. Required. Name of the meter.	Varchar
effective_date	Child element to meter_account. Required. Date that the meter is in service.	Date
terminate_date	Child element to meter_account. Optional. Date that the meter is no longer in service.	Date
meter_type	Child element to meter_account. Required. Type of meter (generation, load, interconnect/tie).	Varchar
ehv	Child element to meter_account. Required.	Varchar
bus_name	Child element to meter_account. Optional. Business name (company).	Varchar

Name	Element Description	Data Type
submitter	Child element to meter_account. Required. Entity submitting the data.	Varchar
reported	Child element to meter_account. Optional, zero or more.	N/A
reported_to	Child element to reported. Required if reported in file. Entity that receives data.	Varchar
reported_factor	Child element to reported. Required.	Number
reported_control_area	Child element to reported. Required. Control area where reported.	Varchar
allocated	Child element to meter_account. Optional, zero or more.	N/A
allocated_to	Child element to allocated. Required if allocated in file. Entity that receives use of asset.	Varchar
allocated_factor	Child element to allocated. Required.	Number
allocated_control_area	Child element to allocated. Required. Control area where allocated.	Varchar

10.5.10 Monthly Meter Corrections

The file is for monthly meter value corrections.

Name	Element Description	Data Type
emtr	Root element for XML hierarchy	N/A
meter_account	Child of root element. Optional, zero or more.	N/A
meter_account_id	Child element to meter_account. Required.	Number
meter_account_name	Child element to meter_account. Required. Name of account.	Varchar
counter_party	Child element to meter_account. Required. Any other party that is allowed access to this data.	Varchar
meter_type	Child element to meter_account. Required. Type of meter (generation, load, interconnect/tie).	Varchar
ehv	Child element to meter_account. Required.	Varchar
original_total	Child element to meter_account. Required.	Number
revised_total	Child element to meter_account. Required.	Number
total_correction	Child element to meter_account. Required	Number
daily_meter_values	Child element to meter_account. Optional, zero or more.	N/A

Name	Element Description	Data Type
interval_definition	Child element to daily_meter_values. See 10.5.1.	N/A
mw_values	Child element to daily_meter_values.	Number

10.5.11 Monthly MV Allocations

The file is for monthly meter value allocations.

Name	Element Description	Data Type
emtr	Root element for XML hierarchy	N/A
interval_definition	Child of root element. See 10.5.1.	N/A
net_ties	Child of root element. Required.	N/A
counter_party_net_tie	Child element to net_ties. Required.	N/A
counter_party	Child element to counter_party_net_tie. Required. Name of counterparty.	Varchar
original_total	Child element to counter_party_net_tie. Optional..	Number
revised_total	Child element to counter_party_net_tie. Optional	Number
total_correction	Child element to counter_party_net_tie. Required.	Number
participant_net_share	Child element to counter_party_net_tie. Required. Market partipant's net share of value.	Number
rate	Child element to counter_party_net_tie. Required. Rate charged for MWh	Number
correction_charge	Child element to counter_party_net_tie. Required. Net charge of correction.	Number
charge_or_credit	Child element to counter_party_net_tie. Required. Charge or credit for charge.	Varchar
generation	Child of root element. Required.	N/A
counter_party_gen	Child element to generation. Required, one or more.	N/A
counter_party	Child element to counter_party_gen. Required. Name of counterparty.	Varchar
original_total	Child element to counter_party_gen. Optional.	Number
revised_total	Child element to counter_party_gen. Optional	Number
total_correction	Child element to counter_party_gen. Required.	Number

Name	Element Description	Data Type
participant_net_share	Child element to counter_party_gen. Required. Market partipant's net share of value.	Number
rate	Child element to counter_party_gen. Required. Rate charged for MWh	Number
correction_charge	Child element to counter_party_gen. Required. Net charge of correction.	Number
charge_or_credit	Child element to counter_party_gen. Required. Charge or credit for charge.	Varchar
total_meter_correction	Child of root element. Required.	N/A
participant_net_share	Child element to total_meter_correction. Required. Market partipant's net share of value.	Number
correction_charge	Child element to total_meter_correction. Required. Net charge of correction.	Number
charge_or_credit	Child element to total_meter_correction. Required. Charge or credit for charge.	Varchar